

THE VALUE OF ASTEREOGNOSIS AS A LOCALIZING SYMPTOM IN CEREBRAL AFFECTIONS.¹

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It has now been established clinically by strong evidence that astereognosis may be produced by lesions of various parts of the nervous system. It may be caused by affections of the cerebral cortex, by subcortical lesions, by lesions in or near the optic thalamus by lesions of the pons and medulla, and, finally, by lesions of the spinal cord or of the peripheral nerves. The exact localization, however, of the lesions which produce this symptom has never been absolutely fixed, and reliable post-mortem data can still furnish us with important information.

The various theories put forth to account for the presence of astereognosis in lesions of various portions of the cerebrum I shall not discuss at length here. The views of Walton and Paul set forth in their most valuable paper in 1901 are those which appear to me to best account for the facts known at the present time. These facts seem to be as follows:

1. Astereognosis occurs in affections of the cerebral cortex in the motor region, whether these affections be traumatic or due to other causes.

2. There is strong evidence clinically that astereognosis occurs in many subcortical lesions. It is a common accompaniment of organic hemiplegia.

3. Astereognosis may occur in lesions of the medulla, as in the well-known case reported by Dercum.

4. Astereognosis occurs clinically in locomotor ataxia, ataxic paraplegia, and possibly other diseases of the spinal cord. It has been found in multiple neuritis.

The number of cases reported with autopsies in which astereognosis has been a prominent symptom, or in which it has been recorded is very small. The evidence for the existence of this symptom in affections of the cortex is almost wholly clinical or

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based upon cases in which the cranium was opened, either directly through trauma or by trephining.

The earliest case of importance in this relation seems to have been that of Wernicke. The patient—a man twenty-one years old—received a blow on the head with a stick in the region of the left arm center.. His speech was at once impaired, being stuttering and stammering; and there was immediate loss of power of the right upper extremity with clumsiness in its movements. Operation was performed the next day and some hours after there was found absolute flaccid paralysis of the fingers and hands, while motion of the forearm and upper arm was retained. There was dulling of the touch over the hand and forearm. The pain and temperature sense were not essentially disturbed. There was persisting asternognosis, which five years later had wholly disappeared.

Von Monakow reports the case of a man twenty-five years old, who struck his head against a hard corner of wood. The scar was in the left parietal region about 1 cm. in front of the transverse line connecting the posterior borders of the auricles and 5 to 5 cm. below the vertex.

Motion and sensation were wholly abolished in the right upper extremity. On operation a wedge-shaped piece of bone was found penetrating about 1 cm. into the cortex. Eight days later, motion of the arm was partially restored. The sensation to touch and temperature sense was diminished; the muscle sense much diminished; sensation to pain retained. Astereognosis was present.

Dr. Burr's case was that of a man twenty-four years old, who when ten years old, had received a severe blow with an axe handle, which caused a depressed fracture of the right parietal bone over the motor area. He seems to have been unconscious for three weeks, and, on recovery of consciousness was found to have a hemiplegia of the whole left half of the body—trunk, limbs, and face and a complete anesthesia of the same side. "The palsy and anesthesia entirely passed away in a few months, though he could not recognize objects grasped with the left hand. This symptom has continued. At the time of the examination, the tactile, pain, and temperature senses were normal. Sense of location of touch over the whole left side." Dr. Burr considered the case hysterical.

Walton and Paul (Case III) report the case of a young woman who thirty-seven days previously had noticed numbness of the right hand. This gradually spread to the elbow and in a few days loss of power in the whole limb followed. Several days later she lost power and sensation in the right leg, and about this time her speech became affected. On examination, touch, pain, and temperature senses were normal. Pressure sense was lessened; posture sense moderately impaired. The sense of location was lost in the palm, normal at the finger tips. Space sense was blunted. Incomplete astereognosis. Operation, twenty-four days later, disclosed a dark, discolored area of the cortex, the size of half a dollar behind the left fissure of Rolando. Nothing else seems to have been detected.

Verger has reported several cases of cortical lesions in which astereognosis was present, but only one in which there was proof by operation of the site of the lesion. (Case XXXVII). Male, forty-six years old, admitted to hospital for left hemiplegia and clonic convulsions of three months' duration. He had complete astereognosis. The cranium was trephined by Dr. Lannelongue, who found a hemorrhagic clot crossing the fissure of Rolando and infringing on the ascending frontal and the ascending parietal convolutions in their middle third. The cortex in this region seemed completely destroyed and the white substance beneath was softened and friable. The patient died, but there was no autopsy.

None of the cases reported above seem to me really conclusive of the existence of astereognosis in a purely cortical lesion, although the presumptive evidence afforded by them is strongly in favor of its existence.

The following case of Raymond (reported by Verger, Case XLIII.) is of more importance in this regard. It was that of a young man with hemiparesis of the right upper extremity and Jacksonian epilepsy, who was operated upon by Chipault. An angioma of the dura mater was removed, together with the subjacent cortical tissue. After the wound was healed and the patient completely cured of the epilepsy, among other sensory symptoms there was still marked astereognosis of the right hand.

We should compare in this connection the case of syphilitic gumma of the dura mater reported by Dana in 1894. Langdon (*JOURNAL OF NERVOUS AND MENTAL DISEASE*, 1901, p. 610),

relates the case of a woman twenty-four years old, with epileptic convulsions, in whom, after an operation over the hand center in the Rolandic area, astereognosis occurred. There was found a localized pachymeningitis over less than one inch of the area and the meningeal membranes were adherent to each other and to the cortex. Apparently nothing more than separation of the dura was attempted.

Dr. L. L. Williams reports the case of a man, twenty-three years old, who had compound fracture of the skull and wound of the arm center. Operation showed laceration of the brain substance apparently about the center of the Rolandic region. Several fragments of bone were imbedded in the brain. There was suppuration and hernia. Astereognosis was noted late in the case. The evidence that astereognosis may occur in subcortical, capsular, and thalamic lesions is incontrovertible. Verger (Case XXXVIII.) relates the case of a patient, male, thirty-one years old, with Jacksonian epilepsy starting in the upper part of the right forearm. After the first attacks, there was a slight hemiparesis. Operation performed by Prof. Demons revealed an abscess quite deeply seated beneath the Rolandic area. The convolutions were only a little congested. After the operation, when the cortex had been more or less bruised by the manipulation, there was total astereognosis of the right hand. This symptom is not mentioned as occurring before the operation and does not seem to have been specially looked for then.

Walton and Paul relate the case of a young woman (Case II.), who had had numbness of the left arm and leg of gradual onset, commencing about six weeks before she was seen, Nov. 17, 1900. Five days after this date she had a sudden left hemiplegia. An operation was performed by Dr. J. C. Warren and a subcortical cyst was found. "The center of the flap was planned to fall just posterior to the fissure of Rolando at the height of the motor centers of the arm." In this case astereognosis was an early symptom, having been detected previous to the onset of the hemiplegia. The patient died and there was no autopsy.

Another case (Case IV.) reported by the same writers showed a hemorrhagic focus and a more or less diffuse lesion in and beneath the cortex in the upper portion of the ascending parietal

convolution. The boundaries of the area affected could not be determined. Astereognosis was noted after the operation.

Dana (Case III.) relates the case of a boy sixteen years old, who, in connection with other sensory symptoms and with hemiparesis of the left extremities, had an astereognosis of the left hand. On operation there was found a spindle-celled sarcoma which infiltrated both pia and cortex of the middle of the anterior central convolution and involved the cortex over the base of the second frontal. It could not be wholly removed and the sensory condition seems to have remained much the same after the operation. This case might be classed among the cortical.

Mills (*JOURNAL OF NERVOUS AND MENTAL DISEASE*, 1901, p. 605) mentions a case of ataxia and astereognosis of the left upper extremity, in which there was a large area of softening, confined so far as could be determined by the naked eye to the superior parietal lobe.

Collins (*JOURNAL OF NERVOUS AND MENTAL DISEASE*, 1901, p. 613) states that the most typical astereognosis he ever saw was produced by a subcortical tumor in the middle of the Rolandic area, which had not wholly pierced the cortex.

Verger has reported a number of interesting cases with autopsies, in which, after destruction or injury of the system of projection fibres from the thalamus to the cortex or of the thalamus itself or the internal capsule, the sensation was affected in the paralyzed and contiguous portions of the body. A detailed description, as far as possible, of the various forms of sensation involved is given. Unfortunately, in these cases astereognosis is not mentioned, and, although we might be justified in assuming its existence, we have no absolute evidence of its occurrence. Case XXXII. seems to be the only one in which its presence is definitely affirmed.

Verger (Case XXXII). Left hemiplegia; left astereognosis of hand. Autopsy showed an old hemorrhagic focus in the postero-external portion of the thalamus. It was elongated transversely and its external extremity invaded the median portion of the posterior segment of the internal capsule. Its height was very moderate, scarcely exceeding the level of the section.

Eskridge and Rogers, under the title of "Traumatic Hemorrhage in the Centrum Ovale Beneath the Left Angular Gyrus,"

report a case in which there was total astereognosis of the right hand and a partial astereognosis of the left. A hemorrhagic focus was found in the anterior portion of the occipital lobe.

The famous case of Mills and Keen needs merely to be referred to. In this there was an endothelioma, with cystic formation, situated chiefly in the corona radiata, not directly involving the thalamus. In its growth it had gradually encroached upon and involved the cortex of the superior parietal convolution. Astereognosis was an early symptom.

My patient was a business man, 58 years old, born in Massachusetts and living in Boston. I saw him in consultation with Dr. Arnold, who was temporarily in charge of the case, on the 11th of July, 1902.

He had been for some time addicted to alcohol, but there was no history of any venereal disease. He was unmarried.

About the 1st of May preceding he began to notice a numbness of the left arm and leg and occasionally of the right leg, and his lower extremities often felt as if they were asleep. He was often unable at night to determine the position of his legs and they would become lost in the bed-clothes.

This condition, however, does not seem to have troubled him much, and it was not until six weeks later that he consulted Dr. Withington, of Boston, his family physician. The most prominent symptom then found was astereognosis of the left hand, with which he was unable to recognize objects. The sensation of the left upper extremity (presumably to touch and pain) was normal. There was some lack of muscular sense in his left hand. The strength of the left grasp was good and there was no evidence of any weakness of the left upper extremity. He has had an increasing inability to execute certain movements with the left hand.

The left lower extremity is in a somewhat similar condition. The sense of location and astereognosis do not appear to have been tested, but the common sensation and muscular sense were the same as in the upper extremity. His gait has been becoming impaired of late. He drags his left foot, and while, if once started, he can walk in a straight line, he complains of an increasing lack of equilibrium. No Romberg present. There was marked exaggeration of the knee-jerks; the plantar reflexes were normal. The right extremities were normal.

Two weeks later it was recorded that his power of walking was less, and towards the end of June he was confined to his room. He would fall unless he could support himself by the wall or otherwise.

When examined by me July 11th his condition was as follows: He had double optic papillitis. Sensation was diminished to touch over the right lower face. The right extremities were normal. There was no definite weakness of the left extremities, though he dragged the left foot in walking. His strength in elevating the legs and in flexing at the knees was good, and all motions of the left upper extremity were strong. The left grasp was equal to the right at this time.

In the left upper extremity the sensation to touch and pain was normal. The temperature sense was good. There was a diminution of the muscle sense in the left hand and an inability to distinguish between one or more points touched simultaneously over the whole extremity. There was astereognosis of the left hand and of the left forearm, as tested by placing various objects against the skin. There was inability to touch the nose with the left forefinger when the eyes were closed and in passing objects from his left hand to his right the hands often failed to meet. Triceps reflexes normal.

In the left lower extremity the sensory conditions were essentially the same except that the sensation to heat was diminished and the muscular sense was not impaired. The tactile and pain senses were normal. The sense of pressure, as indicated by weight, was diminished. There is a loss of sense of location of touch (cannot tell which toe is touched). He feels a pencil laid on lengthwise as a point (astereognosis). There is now some static incoordination. The knee-jerks are exaggerated. The plantar reflexes normal. The Babinski reflex present.

On the 18th of July there was some general improvement in the sensory conditions and he recognized objects more easily with the left hand. Ten days later he could distinguish a heavy object from a light one with the left hand, and could name the majority of objects placed in this hand. Sensations on the left lower extremity cannot be localized and are referred to more distal regions—a prick on the knee is referred to the ball of the foot. On the 26th, left hemianopsia was noted. On the 6th of August he was noticed to have little control of either extremity, though he could now distinguish objects in his left hand fairly well. Four days later there was almost total paralysis of the left limbs. From this time he gradually failed and died about four weeks later.

ABSTRACT OF PATHOLOGICAL FINDINGS.

Anatomical Diagnoses: Arteriosclerosis; chronic diffuse nephritis; brown atrophy and fatty degeneration of the heart muscle; glioma of corpus callosum.

Brain, with tumor and fluid in ventricles, weighs 1490 grams. Dura tense, with somewhat swollen arachnoidal villi. Pia opaque

from enclosed fluid. Pial veins moderately injected. Convolutions flattened, though not markedly and not more upon right than upon left side. After withdrawing about fifty cubic centimeters of clear fluid from each ventricle, an ill-defined increase in consistence, not evident in the uncut brain, is made out over the right vertex.

Upon incision into ventricles, a mass is found in the right side of the corpus callosum, of firm, almost leathery consistency, with a rose gray, moderately vascular interior, containing in places a number of small globular cysts of irregular size, never reaching



Fig. 1.—Frontal section of right hemisphere taken at a plane about 10 cm. posterior to frontal pole (Dejerine's series No. 99). Cross-hatching indicates position of tumor, the borders of which are indefinite except where it abuts upon ventricle.

Fig. 2.—Frontal section of right hemisphere, taken at a plane 8 cm. posterior to frontal pole (Dejerine's series, No. 80). Cross-hatching indicates position of tumor.

one centimeter in diameter, enclosing a clear fluid, or occasionally a jelly-like coagulum.

Upon frontal section, the tumor is found to extend from before backward 8 cm., beginning at a point 5.5 centimeters posterior to frontal pole. The inner limit of tumor is the outer wall of the right lateral ventricle, reduced in the hardened specimen to a slit; but something is still evident of the displacement of median structures toward the right, seen in the fresh brain. The tumor

is ill-defined externally and in places approaches somewhat closely the cortex.

The structures directly involved in the tumor are: The genu, tapetum, and forceps major of the corpus callosum on the right side, with greatest development in the tapetum. The corona radiata and centrum semiovale, for a distance antero-posteriorly corresponding with the extent of the lateral ventricle.

Microscopically, the tumor gives a somewhat striking picture of (a) many multinucleate or giant cells, which show characteristically a rim of large, oval, vesicular, overlapping nuclei, surrounding a clear or homogeneously staining cytoplasm, in which are varying numbers (a pair to scores) of dots, or small rods arranged V-fashion, aggregated in solid groups in a clearer space in the cytoplasm, or occasionally disposed about the clear space, making it seem like a lumen; (b) varying numbers of coarse and fine neuroglia fibrillæ; (c) a moderate number of vessels.

The microscopical picture indicates that the tumor was derived from the ependyma of the lateral ventricle. The original focus is impossible to determine; but is probably opposite the juncture of the genu with the body of the callosum.

Secondary degeneration of the pyramidal tract occurred, probably somewhat late in the course of the disease.

The evidence at the present time derived from autopsies and operations simply tends to confirm the conclusions already reached by Verger and others in regard to affections of the sensibility in general, that in connection with the loss or impairment of certain other forms of sensation, the presence of astereognosis may be caused by lesions of the cortex, by lesions of portions of the thalamus, and, probably, of the internal capsule, and by destruction or injury of the projection fibres running from those regions to the cortex.

As regards the value of astereognosis as a localizing symptom, we can only say that when it occurs alone it rather suggests sub-cortical affections, usually pressure. On the other hand, when in combination with other symptoms, it may serve to confirm or strengthen the diagnosis, but only aids in determining the localization within the wide limits mentioned.

It seems hardly necessary to refer again to the fact that astereognosis occurs also in affections of the medulla, as in Dercum's case of chondrosarcoma, published in 1899, and has been reported in affections of the spinal cord and even in multiple neuritis.